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Test Report for High Speed Alternator of MANIK Engine

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Abstract : The high speed alternator for 'Manik' Engine that is being developed by GTRE was tested at the rated speed of 53000 rpm with AC electrical loading upto 5 kW. This indigenous alternator is one of the most critical parts of the engine. A test rig is designed and developed with suitable air turbine drive at Propulsion Division, NAL-CSIR to map the electrical characteristics of the AC alternator and to assess DC power output of rectifier unit. An air turbine drive was designed to develop 20 kW power at 53000 rpm to drive the alternator. A lubrication system with an in-built reservoir tank is designed to provide cooling to the stator core and to lubricate the alternator bearings. The rig is instrumented with pressure, temperature and flow transducers for compressed air and the lubrication oil. Several vibration pick-ups are mounted on the test stand and the alternator to monitor the vibration signatures. The alternator was initially run up to 53000 rpm in increments without electrical load. The vibration levels were monitored at every incremental speed and resonant frequencies were identified. The alternator was accelerated quickly while passing through the resonant speeds in subsequent runs. The electrical load was applied after crossing 45000 rpm in increments using the DC load bank. After applying full load, the alternator was taken to full speed. The alternator produced 4.8 kW AC power and the DC power after rectification unit was measured to be 4 kW. The alternator and the test rig performed well and all the objectives were met. Successful testing of this alternator gave the confidence to integrate this indigenously developed alternator to the engine.